Petr Stepanov

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Work Experience

Full-Stack Developer

Sticker Store LLC, Portland, OR. *Feb 2023 - Current*

`Node.js` `Express.js` `Modular JavaScript`

- Designed and programmed online e-commerce store (Figma, HTML, CSS, Bootstrap, SASS, Express.JS, EJS, Node.js).
- Improved the Google PageSpeed Insights metrics (CLS, LCP) up to 97%.
- Set up low frequency keyword campaign on Google Analytics.
- Exported local product database to Google Merchant.

C++ Software Developer • Research Collaborator (On-Site)

Thomas Jefferson National Laboratory (JLab), Newport News, VA. *Jul 2020 - Jan 2023*

`CERN ROOT` `Geant4` `High Energy Physics (HEP)` `High Performance Computing (HPC)` `C++` `CMake`

- Coded a Geant4-based simulation for studying the optimal light guide length (range 0-10 cm) for the EM calorimeter used in the Electron-Ion-Collider (EIC) project. Link to GitHub.
- Used Machine Learning (ML) techniques to perform binary classification of thousands of signals from a data acquisition (DAQ) setup. Link to GitHub.
- Applied CERN ROOT framework (C++) to perform statistical analysis of a significant amount (over 100 GB) of the raw experimental data of the Kaon LT experiment at JLab. Link to GitHub.
- Utilized SLURM functionality on the High-Performance Computing (HPC) environment to execute a series of simulations in parallel. This reduced the wall time by more than 10 times.
- Set up data acquisition system that performs triggered waveform acquisition involving 3 devices - Tektronix oscilloscope, Network Attached Storage, and RedHat computer (SAMBA, Python, National Instruments NI-VISA library).
- Contributed 100+ shifts at Hall C at the Thomas Jefferson Particle Accelerator facility for the Pion LT project.

Postdoctoral Researcher • Software Developer (Remote)

Catholic University of America (CUA), Washington, DC. *Jul 2020 - Jan 2023*

`Python` `Fast-Fast BNC Electronics` `Scintillation` `Single Photon Counting`

- Programmed a Geant-4 computer simulation (C++, CMake, Eclipse IDE, gdb) to study the performance of a novel scintillation material for EIC, Brookhaven National Lab. Link to GitHub.
- Visualized energy deposition profiles and calculated energy resolutions for a variety of detector assemblies.
- Teaching experience. Mentoring students within a 3-month Research Experiences for Undergraduates (REU) program at the Physics Department at CUA.
- Enhanced debugging of the CERN library source code led to the publishing of more than 10 bug reports on the ROOT (C++) forum.

Software Developer • Research Assistant

Bowling Green State University (BGSU), Bowling Green, OH. *Aug 2014 - May 2020*

`Data Analysis` `Wolfram Mathematica` `C++` `Makefiles` `e+ Annihilation Spectroscopy`

- Assembled positron lifetime and Doppler spectrometers from ORTEC and Canberra (Mirion) fast electronic units. Utilized High-Purity Germanium Detectors (HPGe) and scintillation-based detector systems for single-photon counting.
- Defined and resolved novel kinetic equations of behavior of e+ and Ps atoms in solids, liquids, and nano-powders (Wolfram Mathematica).
- Developed three open-source programs (C++, CERN ROOT) for fitting and interpretation of the experimental spectra for above data acquisition systems (DAQ).
- Combination of the hardware and software skills allowed for:
  - Estimation of defect concentrations and grain sizes in solids.
  - Classification of defect types (vacancies, dislocations).

    - Characterization of the chemical decoration of defects.
- Developed website (Express.js, Gulp, Bootstrap) and visual identity for the SelimLab research group.

Frontend Developer, UI/UX Designer • Freelance *Sep 2012 - May 2020*

- Made iOS application (Swift, UIkit, storyboards) for the We.Team messenger (more than 3k monthly downloads in AppStore). Participated in cloud-based messenger development with enhanced file sharing capabilities (HTML, React JS, SASS).
- Migrated the landing page for Sweetbridge company from WordPress to Jekyll static site generator (Ruby, CSS). This resulted in a 70% improvement in the page load time.
- Developed the website front-end (Angular.js, HTML, LESS) and iOS mobile application (Ionic) for the Lili Social network.
- Web design.
    - Designed logos, UI/UX prototypes (Figma, Sketch, Illustrator) and branding identity for over 10 different companies.
    - Converted numerous design assets and mockups into responsive HTML and CSS.
    - Mocked up and integrated dozens of cross-browser responsive email templates.

Full Stack Web Developer, Web Designer

Gridnine Systems, Moscow, Russia. *Apr 2011 - Aug 2014*

- Prototyped and designed interactive mockups for Otixo cloud file integrator (Balsamiq, Adobe Creative Suite). Utilized Google Web Toolkit (GWT) Model-View-Presenter (MVP) framework to develop application frontend (JavaScript, responsive CSS).
- Responsible for the front-end development of the ATH American Express – the largest travel management company in Russia (JavaScript, Backbone.js, and RequireJS). Increased the front-end load time by over 30%.
- Implemented image processing servlets on the backend to generate banners for five different social networks (PHP, ImageMagic).
- Wireframed and sliced to web pages numerous UI/UX mockups for web applications (Balsamiq, Photoshop, HTML and CSS).

Computer Science Teacher

Phys-Tech College at MIPT, Moscow, Russia. *Oct 2009 - May 2011*

- Provided instructions and guidance to high school students on the following computer courses: C/C++ programming, HTML, Adobe Photoshop and 3D Studio Max.

Research Scientist

Institute for Theoretical and Experimental Physics (ITEP), Moscow, Russia. *Sep 2008 - Apr 2011*

- Application of positron lifetime spectroscopy for studying the radioactive-induced defects in steels. Monte-Carlo particle simulations with Fortran 95. Maintaining software for CAMECA tomographic atom probe (MSVC). Application of CERN ROOT libraries for fitting and analysis of experimental spectra.

Material Research Skills

- **Characterization facilities**. Positron Lifetime and Doppler Broadening Annihilation Spectroscopy (PALS, DBAR). Atom Probe Tomography (ATP). Scanning Electron Microscopy (SEM). Transmission electron microscopy (TEM). Atomic Force Microscopy (AFM). UV-VIS Spectroscopy. Fourier Transform Infrared Spectroscopy (FTIR).
- **Material processing**. High-temperature annealing. Wet chemical etching. Electrical Contact Fabrication. Sample polishing.

Education

Bowling Green State University (BGSU) • OH, United States *Aug 2014 - May 2020*

Ph.D. in Photochemical Sciences • GPA 3.423. Dissertation: Novel developments in positron spectroscopy (PAS).

- Assembled and utilized two spectrometers: positron lifetime and Doppler. Spectrometers are built from ORTEC and Canberra (Mirion) fast electronic units and utilize High-Purity Germanium Detectors (HPGe) and scintillation-based detector systems.
- Developed open-source software (C++, CERN ROOT) for a novel interpretation of the experimental spectra.

- Defined and resolved kinetic equations of reactions of positron and positronium atoms (Ps) in solids and liquids and nano-powders (Wolfram Mathematica). Equation parameters are implemented in the fitting model of experimental spectra (RooFit).
- Above research allowed for the estimation of defect concentrations and sizes in solids, classification of defect types (vacancies, dislocations), and more...

Ohio Supercomputer Workshop • OH, USA *Jan 2017 - Feb 2017*

Hands-on sessions in High-Performance Computing Infrastructure (HPC, SSH, BASH, SLURM).

British Higher School of Art and Design (BHSAD) • Moscow, Russia *Dec 2011 - Feb 2012*

Three-month intensive in Graphical Design and Visual Communications (illustration, lettering, brand identity).

National Research Nuclear University (MEPhI) • Moscow, Russia *Sep 2004 - Feb 2011*

B.S. and M.S. in Solid State Physics. Thesis: application of PAS for defect concentration studies in bulk materials.

Featured Publications

- S. V. Stepanov, V. M. Byakov et al. Positronium in Biosystems and Medicine: A New Approach to Tumor Diagnostics Based on Correlation between Oxygenation of Tissues and Lifetime of the Positronium Atom. *Physics of Wave Phenomena* **2021**, 29 (2), 174-179. 10.3103/s1541308x21020138.
- P. S. Stepanov, F. A. Selim et al. Interaction of positronium with dissolved oxygen in liquids. *Physical Chemistry Chemical Physics* **2020**, 22 (9), 5123-5131. 10.1039/c9cp06105c.
- P. S. Stepanov, F. A. Selim et al. A model for joint processing of LT and CDB spectra of dielectric nano-sized powders. *AIP Conference Proceedings 2182* **2019**. 10.1063/1.5135836.
- P.S. Stepanov, S.V. Stepanov et al. Developing New Routine for Processing Two-Dimensional Coincidence Doppler Energy Spectra and Evaluation of Electron Subsystem Properties in Metals. *Acta Physica Polonica A* **2017**, 132 (5), 1628-1633. 10.12693/aphyspola.132.1628.

Conferences

18th International Conference on Positron Annihilation (ICPA-18) *Aug 2018*

Orlando, FL, USA

Oral talk "Positions and Ps in Al_2O_3 Nanopowders

International Workshop on Physics with Positrons (JPos17) *Sept 2017*

JLab, Newport News, VA, USA

Poster "A routine of background subtraction from two-dimensional Doppler broadened spectra"

12th International Workshop on Positron and Positronium Chemistry (PPC12) *Sept 2017*

Maria Curie-Sklodowska University, Lublin, Poland

Poster "Developing new routine for processing two-dimensional coincidence Doppler energy spectra"

Ohio Photochemical Society Meeting (Oops) *May 2017*

Maumee Bay Lodge & Conference Center, Maumee, OH, USA

Poster "Developing new routine for background subtraction in two-dimensional coincidence Doppler broadening spectroscopy"

58th Electronic Materials Conference (EMC) *Jun 2016*

University of Delaware, Newark, DE, USA

Oral talk "High-Sensitivity Measurements of Defects in ZnO by Means of Digital Coincidence Doppler Broadening of Positron Annihilation Spectroscopy"

Annual Spring Meeting of the APS Ohio-Region *Apr 2016*

University of Dayton, Dayton, OH, USA

Oral talk "Identification of chemical environment of defects in ZnO by means of digital coincidence Doppler broadening of positron annihilation radiation"

Ohio Inorganic Weekend *Nov 2015*

Bowling Green State University, OH, USA

Poster "Approaching Structural Defect Characterization and their Chemical Identification by Means of Coincidence Doppler Broadening of Annihilation Radiation"

41st Polish Seminar on Positron Annihilation (PSPA-13) *Sep 2013*

Maria Curie-Sklodowska University, Lublin, Poland

Oral talk "Application of positron spectroscopy for detection of nanostructures in alcohol—aqueous mixtures"

Professional Networks

- Find examples of my code on GitHub (50+ repositories).
- Discover my professional contacts on LinkedIn (200+ connections).
- Skim through the list of my publications on Google Scholar (24 articles, 300+ citations).
- Check out my UI and UX design portfolio on Dribbble (50+ shots).

Relevant Interests

- Hosting an open-source project for keyboard remapping on Linux 300+ stars on GitHub.
- Developed a persistent RAMDisk plugin for Linux that provides 50% increase in source code indexing time.
- Created two shared libraries for the ROOT data analysis framework [1, 2].